5.2.4. Mission Utility and Integration

5.2.4.1. Purpose

The purpose of this test is to qualitatively assess the overall utility of the SMS for the assigned mission and the integration and compatibility of the SMS parameters, controls and display within the airplane.

5.2.4.2. General

The mission utility and integration test is the most important test of the series. During this test, mission relatable ingresses, weapons deliveries, intercepts and attacks are performed to qualitatively assess the SMS. The quantitative assessments of the previous tests are used to support and justify the qualitative determinations made during the ingresses, weapons deliveries, intercepts and attacks.

Utility refers to the overall usefulness of the SMS as it is implemented, as an aid to the mission. The SMS parameters must match the expected operational needs. Integration refers to the way the SMS has been blended into the entire airborne system. From the evaluator's standpoint this characteristic is intimately tied into the area of human factors.

The qualitative assessments in mission relatable scenarios specifically called for in the previous tests are also performed during these evaluations. Care should be taken; however, to ensure that the evaluator does not get too involved in recording qualitative comments to the detriment of watching the progress of the intercept and evaluating the SMS. A conscious effort should be made not to get too involved in looking for specifics on at least the first run to ensure that an overall qualitative assessment can be made. A voice recorder can be used to make comments without distracting the evaluator from the performance of the run or the outbound run can be used to record results.

Multiple runs should be performed using different SMS selections in as many different types of attacks as possible (including supersonic runs, if applicable, to assess the utility of the SMS in highly time critical attacks and intercepts). The most likely scenarios should be performed first and others performed as flight time allows.

5.2.4.3. Instrumentation

Data cards are required for this test. A voice recorder is highly recommended.

5.2.4.4. Data Required

Record qualitative comments concerning the utility and integration of the SMS. Record the effects of the parameters determined in previous tests during the intercepts and attacks as called for at the end of each test procedure.

5.2.4.5. Procedure

For the air-to-air portion of the evaluation, place the target beyond the maximum detection range for the radar for the mode being used. Place the target 1,000 feet above the test airplane for the first run. Use the most likely, long range intercept mode for the first run and the rest in order of priority as time allows. Use a medium to wide scan angle limit and a long range scale with a two to four bar pattern to simulate a search for an inbound threat. Call for the target to turn inbound and turn the test airplane towards the target. Use a mission relatable subsonic intercept speed for the first run (usually Mach (M) 0.85 to 0.9 for both the target and test airplane is adequate). It is important to use enough speed, since the closure rate will affect the evaluation of the SMS and the workload required to select and deliver weapons. Perform a normal intercept, optimizing the range scale, scan angle limits, antenna elevation angle etc. until the target is confirmed and an STT is acquired. Select and perform a simulated launch of the long range, medium range and short range front profile weapons as the launch envelope for each is reached. Continue inbound and convert the intercept to an astern attack of the target as the target continues to fly straight and level. Use the ACM modes during the conversion and simulate the selection and firing of weapons, paying particular attention to the required workload upon the tactics used for each weapon.

If two targets are available, use them both on at least one intercept and then split them onto two stations, switching from one to the other (three in a barrel) to maximize the number of intercepts during the flight. If time, fuel and airspace permit, perform one supersonic intercept to minimize the time available to make the required manipulations of the SMS. If time permits, allow the target to maneuver up

to 30° and 5,000 feet (excluding 1,000 above or below the test airplane altitude) off of the planned track without informing the evaluator of the maneuver beforehand, to simulate a moderately "jinking" target. Record qualitative comments concerning the utility of the SMS for the assigned mission, including the effects of the parameters determined during previous tests and the overall integration of the SMS into the airplane.

For the air-to-ground portion of the evaluation select a mission relatable target in the test area that allows for a 35 to 40 nm ingress to the target location. Descend to a low ingress altitude and set an airspeed which would normally be selected for an attack of a defended target. Head inbound to the target and select a radar mapping mode with at least a 40 nm scale and a wide scan pattern useful for radar navigation. Perform radar navigation inbound to the target (for instance following a river or ridge line that leads to the target) and search for the target on the display. Perform simulated deliveries of stand-off weapons. Continue to update the antenna elevation angle, display range and antenna pointing angle to optimize the display for navigation and target search. When the target breaks out, select the DBS modes and continue to update the target position. Execute the type weapon delivery most likely for the test airplane and the type of target selected. Turn outbound, selecting a mapping mode and navigate outbound from the target area to the start point. Repeat the ingress and attack using different delivery modes, weapons and if available, different target types.

5.2.4.6. Data Analysis and Presentation

Relate the qualitative deficiencies noted to their effects upon the performance of the ingresses, weapons deliveries, intercepts and astern conversions. Note any limitations upon tactics imposed by the SMS parameters, utility or integration. Use the applicable results from the previous tests to support the qualitative results.

5.2.4.7. Data Cards

Sample data cards are presented as cards 73 and 74.

300

CARD NUMBER TIME ____ PRIORITY L/M/H

SMS AIR-TO-AIR MISSION UTILITY AND INTEGRATION

[POSITION THE TARGET ON THE NOSE AT ___ NM AND 1,000 FEET ABOVE THE TEST AIRPLANE. TURN THE TARGET AND TEST AIRPLANE TOWARDS EACH OTHER, ACCELERATING TO M=__. USE THE ____ MODE, WIDE SCAN ANGLE LIMIT, ____BAR PATTERN, AND ____ NM RANGE SCALE. GAIN AN STT AND CONTINUE INBOUND. SIMULATE A LONG RANGE MISSILE LAUNCH, A MEDIUM RANGE HEAD-ON SHOT THEN A SHORT RANGE HEAD-ON SHOT. OFFSET THE TARGET AT 10 NM AND PERFORM AN ASTERN CONVERSION. USE THE ACM MODES DURING THE CONVERSION. SIMULATE ASTERN MISSILE AND GUN ATTACKS. MAKE NOTES CONCERNING THE MISSION UTILITY, INTEGRATION AND THE EFFECTS OF SMS PARAMETERS. REPEAT WITH THE TARGET AT ___ FEET AGL. REPEAT THE TEST WITH THE TARGET AND TEST AIRPLANE AT M=___.]

NOTES:

Card 73: SMS Air-To-Air Mission Utility And Integration Data Card

CARD NUMBER ____ TIME ___ PRIORITY L/M/H

SMS AIR-TO-GROUND MISSION UTILITY AND INTEGRATION

[DESCEND TO ___ FEET AGL AND SET MACH=___. SELECT THE MAP MODE, ___ NM RANGE SCALE AND THE __° SCAN ANGLE LIMIT. START AT _____ AND FLY INBOUND TO THE _____ TARGET AT AN INITIAL HEADING OF ___. RADAR NAVIGATE TOWARD THE TARGET AREA AND WHEN IN CONTACT WITH THE TARGET SELECT DBS. PERFORM A SIMULATED _____ STAND OFF WEAPON DELIVERY, THEN PERFORM A SIMULATED _____ WEAPON DELIVERY. TURN OUTBOUND AND NAVIGATE BACK TO THE START POINT. REPEAT WITH DIFFERENT DELIVERIES AND TARGETS.]

NOTES:

Card 74: SMS Air-To-Ground Mission Utility and Integration Data Card

5.2.5. Introduction to Advanced Stores Management Set Test Techniques

As mentioned in Chapter 1, only the most rudimentary form of the Stores Management Set test techniques are presented in this book. Chapter 1 details the reasons for this format; however, in many applications, more rigor, accuracy and documentation of results are required. Table VII outlines additional instrumentation and assets which are typically applied in these more advanced tests. The purpose of this table is merely to emphasize the existence of these advanced techniques. Further, this list is not exhaustive. Many innovative uses of assets and instrumentation exist. It is hoped that the examples provided leave the reader with a taste of how the test can be made more rigorous through the judicious use of instrumentation. In application; the user must refer to the more advanced documents referenced in Chapter 1 or solicit help from more experienced testers.

Table VII: Additional Assets or Instrumentation for use in Advanced Stores Management Set Tests

Test	Additional Asset or Instrumentation	Purpose/Benefit
Stores Management Set Integration Ground Tests.	Digital Recorder. Video recording of operator actions and stores stations.	If a data bus is used in the stores management architecture, the time stamped bus activity is recorded in order to compare to the actual electrical signals sent to each station as the tests are performed. Digital data exchanged between the Stores Management Set (SMS) and the stores on each station are recorded. Time stamped video is made of the operator actions and displays for correlation with the time stamped bus activity. Video is made of the activity on each station in order to document coupler and umbilical deficiencies.
Preflight and Built-in-Tests.	Digital Recorder.	Typically records data from the data bus on which Stores Management Set passes the BIT results and receives results from the stores stations. Allows precise documentation of test results. Usually used in conjunction with fault insertion tests.
	Video recording of display.	Provides automatic recording of what the operator sees as the fault status is displayed.
Controls and Displays.	Video recording of display.	Allows automatic documentation of display problems as well as post-flight analysis and evaluation.
	Cockpit mock-ups, reconfigurable cockpits and virtual cockpits.	Typically used for in-depth ground tests of human factors and in iterative cockpit design.
	Digital recording of operator actions.	Can be used as a means of precisely recording operator selections to document noted problems and as a means of performing operator tasking analysis.

Table VII:Additional Assets or Instrumentation for use in Advanced Stores Management Set Tests

Test	Additional Asset or Instrumentation	Purpose/Benefit
Mission Utility and Integration.	Same as in the Stores Management Set Integration Ground Tests.	This test requires the largest amount of data to completely document the results. It is during this test that most of the unexpected problems are found. In anticipation of having to document these deficiencies, maximum instrumentation are sometimes brought to bear for this test in case unforseen data are required in post-flight analysis.